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EXAMINER

CANTELMO, GREGG

ART UNIT

PAPER NUMBER

1745

7

DATE MAILED: 04/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-7

Office Action Summary

Application No.

10/068,154

Applicant(s)

FRANKLIN ET AL.

Examiner

Gregg Cantelmo

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1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Claim 11 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.
2. Applicant's election without traverse of Group I claims 1-10 and 12-21 in Paper No. 6 is acknowledged. The Examiner recognizes that claims 12 and 13 are drawn to a bipolar separator and therefore have been rejoined with Group I.

Priority

3. This application appears to be a division of Application No. 09/834,390, filed April 13, 2001. A later application for a distinct or independent invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in an earlier or parent application is known as a divisional application or "division." The divisional application should set forth only that portion of the earlier disclosure which is germane to the invention as claimed in the divisional application. Note that Application No. 09/834,390 claims benefit of U.S. Provisional Application No. 60/226,471 filed August 18, 2000.

Information Disclosure Statement

4. No IDS appears to have been filed with the application prior to this office action.

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5. Since this application is a continuation application filed under 37 CFR 1.53 (b), the examiner has considered information, which has been considered by the Office in the parent applications. Such information need not be resubmitted in the continuing application unless the applicant desires the information to be printed on the patent.

6. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Drawings

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because:

- a. Reference characters "46 and 56" have been used to designate both the MEAs and manifold seals or adhesives (page 7, lines 15-22);
- b. Reference character "51B" has been used to designate both a reactant manifold (page 7, lines 221-22 and an edge seal (See Fig. 5C).

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

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8. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: reference character 56B in Fig. 5B is not found in the written description. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

9. The disclosure is objected to because of the following informalities: the status of U.S. patent Application No. 09/834,390 should be updated since it has been abandoned.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 4-6 recites the limitation "said springs" therein. There is insufficient antecedent basis for this limitation in the claims. Note that claim 3 is the first claim to

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recite the term "spring" and it may be better served for claims 4-6 to be dependent upon claim 3.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-3, 5, 8-10 and 12-21 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,270,131 (Diethelm).

Diethelm discloses a fuel cell assembly (Fig. 7) comprising a membrane electrode assembly (1a/1b/1c), a bipolar separator plate 30 and independently acting compliant electrical contacts 4 disposed between the membrane electrode assembly (MEA) and the bipolar separator plate (Fig. 7 as applied to claim 1).

Diethelm discloses a fuel cell stack (Fig. 7) comprised of a first assembly according to claim 1 and a second assembly according to claim 1, wherein the electrical contacts 4 of the first assembly are in electrical contact with the MEA of the second assembly (as applied to claim 2).

The electrical contact members are flexible so that they can resiliently respond to changes in size of the cell but are also sufficiently rigid to provide support for the electrode plate (col. 4, ll. 14-19). These members being both flexible and resilient are held to have spring properties (as applied to claim 3).

The contact elements can be S-shaped (col. 4, ll. 64-66 as applied to claim 5).

The electrical contacts 4 are formed into an array having a length and width, wherein the MEA has a respective length and width and wherein the length and width of the array of contacts 4 is spans the length and width of the MEA (Figs. 6 and 7 as applied to claims 8-10).

Diethelm discloses independently acting compliant electrical contacts 4 for maintaining electrical contact between a bipolar separator plate 30 and a membrane electrode assembly (1a/1b/1c) in a fuel cell stack (Fig. 7 as applied to claim 12).

The electrical contact members are flexible so that they can resiliently respond to changes in size of the cell but are also sufficiently rigid to provide support for the electrode plate (col. 4, ll. 14-19). These members being both flexible and resilient are held to have spring properties (as applied to claim 13).

Diethelm discloses a method for maintaining electrical contact between a bipolar separator plate 30 and a membrane electrode assembly (1a/1b/1c) comprising placing independently acting compliant electrical contacts 4 between said bipolar separator plate 30 and said membrane electrode assembly (MEA) in a fuel cell stack (Fig. 7 as applied to claim 14).

Diethelm discloses a fuel cell assembly (Fig. 7) comprising a membrane electrode assembly (1a/1b/1c), a bipolar separator plate 30 and means 4 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate. The claim does not specify the degree of flexibility of the means for

making electrical contact. All materials, including the elements 4 have a degree of flex relative to the amount of force exerted upon the material (Fig. 6 as applied to claim 15).

Diethelm discloses a fuel cell assembly (Fig. 6) comprising a membrane electrode assembly (1a/1b/1c), a bipolar separator plate 30 and electric contact members 4 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate. The claim does not specify the degree of flexibility of the electrical contact members for making electrical contact. All materials, including the elements 4 have a degree of flex relative to the amount of force exerted upon the material (Figs. 6 and 7 as applied to claim 16).

The electrical contact members are flexible so that they can resiliently respond to changes in size of the cell but are also sufficiently rigid to provide support for the electrode plate (col. 4, ll. 14-19). These members being both flexible and resilient are held to have spring properties (as applied to claim 17).

The fuel cell assembly of Diethelm comprises a bipolar separator plate 30, having first and second sides; a membrane electrode assembly (1a/1b/1c) attached to the first side of the separator 30 via either contacts 4 or edge sealing means and sealed along the periphery of the MEA, and independently-acting compliant electrical contacts are attached to the second side of the separator (Fig. 7 as applied to claim 18).

Diethelm discloses a fuel cell stack (Fig. 7) comprised of a first assembly according to claim 18 and a second assembly according to claim 18, wherein the electrical contacts 4 of the first assembly are in electrical contact with the MEA of the second assembly (as applied to claim 19).

Diethelm discloses a fuel cell assembly (Fig. 7) comprising a membrane electrode assembly (1a/1b/1c), a bipolar separator plate 30 and an independently-acting compliant electrical contact 4 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate (as applied to claim 20).

Diethelm discloses a fuel cell assembly (Fig. 7) comprising a membrane electrode assembly (1a/1b/1c), a bipolar separator plate 30 first means 4 for maintaining electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate and second means along the periphery of the stack for sealing the MEA with the bipolar separator plate 30 wherein the second means functions independently from the first means (Fig. 6 as applied to claim 21).

13. Claims 1, 2, 8, 9, 12, 14-16 and 18-21 are rejected under 35 U.S.C. 102(b) as being anticipated by WO 97/27638 A (WP '638).

WO '638 discloses a fuel cell assembly (Fig. 2) comprising a membrane electrode assembly (17/18/19), a bipolar separator plate 21 and independently acting compliant electrical contacts 20 disposed between the membrane electrode assembly (MEA) and the bipolar separator plate (Fig. 2 as applied to claim 1).

WO '638 discloses a fuel cell stack (Fig. 2) comprised of a first assembly according to claim 1 and a second assembly according to claim 1, wherein the electrical contacts 20 of the first assembly are in electrical contact with the MEA of the second assembly (as applied to claim 2).

The electrical contacts 20 are formed into an array having a length or width, wherein the MEA has a respective length or width and wherein the length or width of the

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array of contacts 20 is approximately equal to the length or width of the MEA (Fig. 2 as applied to claims 8-9).

WO '638 discloses independently acting compliant electrical contacts 20 for maintaining electrical contact between a bipolar separator plate 21 and a membrane electrode assembly (17/18/19) in a fuel cell stack (Fig. 2 as applied to claim 12).

WO '638 discloses a method for maintaining electrical contact between a bipolar separator plate 21 and a membrane electrode assembly (17/18/19) comprising placing independently acting compliant electrical contacts 20 between said bipolar separator plate 21 and said membrane electrode assembly (17/18/19) in a fuel cell stack (Fig. 2 as applied to claim 14).

WO '638 discloses a fuel cell assembly (Fig. 2) comprising a membrane electrode assembly (17/18/19), a bipolar separator plate 21 and means 20 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate. The claim does not specify the degree of flexibility of the means for making electrical contact. All materials, including the elements 20 have a degree of flex relative to the amount of force exerted upon the material (Fig. 2 as applied to claim 15).

WO '638 discloses a fuel cell assembly (Fig. 2) comprising a membrane electrode assembly (17/18/19), a bipolar separator plate 21 and electric contact members 20 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate. The claim does not specify the degree of flexibility of the electrical contact members for making electrical contact. All materials,

including the elements 20 have a degree of flex relative to the amount of force exerted upon the material (Fig. 2 as applied to claim 16).

The fuel cell assembly of WO '638 comprises a bipolar separator plate 21, having first and second sides; a membrane electrode assembly (17/18/19) attached to the first side of the separator 21 via either contacts 20 or edge sealing means and sealed along the periphery of the MEA, and independently-acting compliant electrical contacts are attached to the second side of the separator (Fig. 2 as applied to claim 18).

WO '638 discloses a fuel cell stack (Fig. 2) comprised of a first assembly according to claim 18 and a second assembly according to claim 18, wherein the electrical contacts 20 of the first assembly are in electrical contact with the MEA of the second assembly (as applied to claim 19).

WO '638 discloses a fuel cell assembly (Fig. 2) comprising a membrane electrode assembly (17/18/19), a bipolar separator plate 21 and an independently-acting compliant electrical contact 20 for making electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate (Fig. 2 as applied to claim 20).

WO '638 discloses a fuel cell assembly (Fig. 2) comprising a membrane electrode assembly (17/18/19), a bipolar separator plate 21 first means 20 for maintaining electrical contact between the membrane electrode assembly (MEA) and the bipolar separator plate and second means along the periphery of the stack for sealing the MEA with the bipolar separator plate 20 wherein the second means functions independently from the first means (Fig. 2 as applied to claim 21).

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Diethelm in view of U.S. patent No. 6,224,396 (Chan).

The teachings of claims 1, 12 and 16 with respect to Diethelm have been discussed above and are incorporated herein.

The differences between the instant claims and WO '638 are that WO '638 does not disclose that the contacts 20 are springs having an inverted V-shape (claim 4) or X-shape (claim 6).

A Z-shape is comprised of two V-shaped portions wherein one V-shape portion of the Z-shape spring is inverted relative to the other V-shaped portion of the Z-shape spring (Fig. 5C as applied to claim 5).

Chan discloses that spring connectors and more particularly Z-shaped electrical contacts have been conceived and applied in the art of electrical connections (abstract, col. 5, ll. 8-11 and figures). The Z-shaped configuration prevents bowing or cracking of the connected structure (abstract as applied to claim 6).

The motivation for using a Z-shaped configuration which comprises inverted V-shaped sections therein for the electrical contacts is that it provides a contact shape that eliminates bowing or cracking of the electrical contacts.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Diethelm by using a Z-shaped configuration which comprises inverted V-shaped sections therein for the electrical contacts since it would have provided a contact shape that eliminates bowing or cracking of the electrical contacts.

16. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Diethelm in view of U.S. Patent No. 5,299,939 (Walker).

The teachings of claims 1, 12 and 16 with respect to Diethelm have been discussed above and are incorporated herein.

The differences between the instant claims and Diethelm are that Diethelm does not disclose that the contacts 20 are springs (claims 3, 13 and 17) or springs are omega shaped having a height and a tapered middle section, said tapered middle section having a width and wherein the width is at least 50% as great as the height (claim 7).

Walker discloses that spring connectors and more particularly omega-shaped electrical contacts have been conceived and applied in the art of electrical connections (abstract, 1-3) and the width of the sides of the connectors are at least 50% as great as the height of the connector.

The motivation for using a omega-shaped contacts for the electrical contacts is that it provides contacts having a high density, substantial compliance to provide

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compensation variations such as manufacturing tolerances and thermo-mechanical expansion, low contact resistance and low inductance. In addition the omega-shaped contact function that when an external force is applied on the spring, the spring deflects accordingly (Fig. 3).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Diethelm by using an omega-shaped contact having a tapered middle section, said tapered middle section having a width and wherein the width is at least 50% as great as the height since it would have provided contacts having a high density, substantial compliance to provide compensation variations such as manufacturing tolerances and thermo-mechanical expansion, low contact resistance and low inductance.

17.

18. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO '638 in view of Diethelm.

The teachings of claims 1 and 8 with respect to WO '638 have been discussed above and are incorporated herein.

The difference not yet discussed of the electrical contacts 20 are formed into an array having a length, wherein the MEA has a length and wherein the length of the array of contacts 20 is approximately equal to the length of the MEA and also formed into an array having a width, wherein the MEA has a width and wherein the width of the array of contacts 20 is approximately width to the length of the MEA (claim 10).

As shown in the cross sectional view of Fig. 2, the cross-section represents either a width or a length of the fuel cell stack.

While WO '638 does not show or explicitly disclose a three dimensional arrangement of the contacts 20 relative to the fuel cell stack, one of ordinary skill in the art would have employed the contacts in both the length and width directions along the cell to maximize the electrical contact between the entire surfaces of the MEA layers and separators through the array of electrical contacts.

Diethelm discloses a similar arrangement and further of disposing the contacts 8b in both a length and width direction of the MEA (Figs. 6 and 7).

The motivation for extending the contacts along both the width and length of the fuel cell stack is to maximize the electrical contact between the entire surfaces of the MEA layers and separators through the array of electrical contacts.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '638 by extending the contacts along both the width and length of the fuel cell stack since it would have maximized the electrical contact between the entire surfaces of the MEA layers and separators through the array of electrical contacts.

19. Claims 3-6, 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO '638 in view of U.S. patent No. 6,224,396 (Chan).

The teachings of claims 1, 12 and 16 with respect to WO '638 have been discussed above and are incorporated herein.

The differences between the instant claims and WO '638 are that WO '638 does not disclose that the contacts 20 are springs (claims 3, 13 and 17) or of the springs having an inverted V-shape (claim 4), S-shape (claim 5) or Z-shape (claim 6).

Chan discloses that spring connectors and more particularly Z-shaped electrical contacts have been conceived and applied in the art of electrical connections (abstract, col. 5, ll. 8-11 and figures). The Z-shaped configuration prevents bowing or cracking of the connected structure (abstract as applied to claims 3, 6, 13 and 17).

A Z-shape is comprises of two V-shaped portions wherein one V-shape portion of the Z-shape spring is inverted relative to the other V-shaped portion of the Z-shape spring (Fig. 5C as applied to claims 3, 4, 13 and 17).

Alternatively the springs can have an S-shape (Fig. 7E). While Chan labels this shape as the shape of a 2, it is evident from the Fig. 7E that this also constitutes an S shape (as applied to claims 3, 5, 13 and 17)

The motivation for using a Z-shaped configuration which comprises inverted V-shaped sections therein or an S-shaped configuration for the electrical contacts is that it provides a contact shape that eliminates bowing or cracking of the electrical contacts.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '638 by using a Z-shaped configuration which comprises inverted V-shaped sections therein or an S-shaped configuration for the electrical contacts since it would have provided a contact shape that eliminates bowing or cracking of the electrical contacts.

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20. Claims 3, 7, 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO '638 in view of U.S. Patent No. 5,299,939 (Walker).

The teachings of claims 1, 12 and 16 have been discussed above and are incorporated herein.

The differences between the instant claims and WO '638 are that WO '638 does not disclose that the contacts 20 are springs (claims 3, 13 and 17) or springs are omega shaped having a height and a tapered middle section, said tapered middle section having a width and wherein the width is at least 50% as great as the height (claim 7).

Walker discloses that spring connectors and more particularly omega-shaped electrical contacts have been conceived and applied in the art of electrical connections (abstract, 1-3) and the width of the sides of the connectors are at least 50% as great as the height of the connector.

The motivation for using a omega-shaped contacts for the electrical contacts is that it provides contacts having a high density, substantial compliance to provide compensation variations such as manufacturing tolerances and thermo-mechanical expansion, low contact resistance and low inductance. In addition the omega-shaped contact function that when an external force is applied on the spring, the spring deflects accordingly (Fig. 3).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '638 by using an omega-shaped contact having a tapered middle section, said tapered middle section having a width and wherein the width is at least 50% as great as the height since it

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would have provided contacts having a high density, substantial compliance to provide compensation variations such as manufacturing tolerances and thermo-mechanical expansion, low contact resistance and low inductance.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent No. 6,080,502 is an English equivalent to WO '638. U.S. patent No. 6,299,999 discloses an electrical contact member 1 disposed between adjacent fuel cells. U.S. patent No. 5,773,161 discloses contact elements 11B disposed between a bipolar separator and an MEA 12.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner

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April 8, 2003


Patrick Ryan
Supervisory Patent Examiner
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